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Role of electronic-commerce in the growth of Tunisian economy

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THESIS

ROLE OF ELECTRONIC-COMMERCE IN THE GROWTH OF TUNISIAN ECONOMY

by

Neji Hasni

September 2002

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13. ABSTRACT ***(maximum 200 words)***

Tunisia has encouraged and enhanced the effective use of information technologies, including the Internet by making them widely accessible. The government started an action plan in 1997 to spread Internet connections to all classes of the community. In the meantime the government understood the benefits provided by e-commerce and established an electronic commerce taskforce (from the government and the private sectors) to study the implementation of e-commerce in Tunisia. Following that, six pilot projects about various Tunisian-made products and services were launched online. Today e-commerce services covering a wide range of Tunisian products including crafts, foodstuffs (dates, olive oil, and desserts), textiles, tourist services, stamps, and hotel reservations. A direct result of this general atmosphere of e-commerce is the emergence of trade exponentially as an important sector in the Tunisian economy. The incorporation of information technology as an important ingredient of its economy resulted in a steady growth of the country's Gross Domestic Product (GDP). Its exponential adoption of the Internet and its applications, principally e-commerce, seemingly contributed to the Tunisian economic growth.

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ROLE OF ELECTRONIC-COMMERCE IN THE GROWTH OF TUNISIAN ECONOMY

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requirements for the degree of

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from the

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ABSTRACT

Tunisia has encouraged and enhanced the effective use of information technologies, including the Internet by making them widely accessible. The government started an action plan in 1997 to spread Internet connections to all classes of the community. In the meantime the government understood the benefits provided by e-commerce and established an electronic commerce taskforce (from the government and the private sectors) to study the implementation of e-commerce in Tunisia. Following that, six pilot projects about various Tunisian-made products and services were launched online. Today e-commerce services covering a wide range of Tunisian products including crafts, foodstuffs (dates, olive oil, and desserts), textiles, tourist services, stamps, and hotel reservations. A direct result of this general atmosphere of e-commerce is the emergence of trade exponentially as an important sector in the Tunisian economy. The incorporation of information technology as an important ingredient of its economy resulted in a steady growth of the country's Gross Domestic Product (GDP). Its exponential adoption of the Internet and its applications, principally e-commerce, seemingly contributed to the Tunisian economic growth.

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I. LITERATURE

E-commerce is a new way to conduct the world's commerce. Its main benefit is its ability to serve all the partakers around the world without restriction on geography or physical presence. Access by users to web sites is relatively simple. Furthermore, with the appropriate implementation of a web site, users can become buyers. This technique enables sellers and buyers to shop any time, not just when a store is open. This in turn, should increase sales revenue. In addition, the buyer may access product information without intimidating queries by a sales representative; this makes the shopping experience less stressful. E-commerce tools have lowered the bar for selling by anyone, anywhere, anytime.

There are tools on the market such as Dreamweaver, FrontPage that promise to help all categories of businesses and customers (teachers and student, artists, grocery stores, and gift shops) to buy and sell on the Internet. Some of these tools can be purchased for less than $50. By providing stored templates, the seller does not have to know anything about html or web page design. Therefore, with its broad reach and flexibility, e-commerce is becoming an increasingly important selling channel for today's businesses. Even firms that have always relied on face-to-face customer interaction have launched e-commerce web sites.

The web is the most effective venue for selling products and services with simple clicks of a mouse, and also to present information from several different perspectives. The results of reports done by various reliable sources and experts such as Harvard Business School and New York University Stern School of Business showed that e-commerce is growing rapidly around the globe despite the recent downturns in the sector. In the U.S., it is expected to be one of the engines for economic growth in the next century. In Europe and Australia, e-commerce has had significant growth. Meanwhile in Asia and Africa, although e-commerce revenues will not come close to the U.S. and European levels, there is a strong interest in e-commerce.

In March 2000, Catherine L. Mann (Institute for International Economics) estimated "according to respected sources such as Forrester Research" that world wide

electronic commerce revenues will surpass $300 billion by the end of 2002 and may reach $1.3 trillion in 2003. [1]

Cyber Atlas staff in their article "B2B E-commerce headed for trillions" March 7, 2002 reported more ambitious projections than Forrester's [2]. EMarketer found that worldwide Business-to-Business (B2B) e-commerce will total $823.4 billion by the end of 2002, and the growth will continue to nearly $2.4 trillion by 2004. [3]

"Despite last year's difficult economic climate, many companies pressed on with their e-business initiatives, continuing to lay the foundation for e-commerce trade," said Steve Butler, senior analyst at eMarketer [3]. However International Data Corporation (IDC) expected that the total worldwide value of goods and services purchased by businesses through e-commerce solutions will increase from $282 billion in 2000 to $4.3 trillion by 2005. [2]

According to the same source

> the United States will remain the largest region for B2B e-commerce, with purchases increasing at an annual growth rate of 68 percent from 2001 to 2005. Close behind is Western Europe, where B2B purchasing will increase at a compound annual growth rate of 91 percent from 2001 to 2005. Asia-Pacific is the growth leader with a compound annual growth rate of 109 percent during this time.

Another report by Beth Cox (Internet News E-Commerce Reporter) in her article "the E-Commerce Evolution" illustrates the comScore Networks example which said that its review of consumer e-commerce for the first quarter of 2002 showed consumer sales in the United States set a record of about $17 billion. Beth added, "It looks like this Internet thing might have some legs after all, despite the hundreds of dot bombs". [4]

In the travel field, the same source said online sales totaled an estimated $10.1 billion, reflecting 30 percent growth over the first quarter of 2001 and a decline of 7 percent versus the holiday-driven fourth quarter of 2001. ComScore said that consumers spent nearly $7 billion at domestic travel sites in the first quarter of 2002, an increase of 87 percent versus the same period in 2001. [4]

In the meantime, according to Brian Morrissey, Expedia travel services returned net income of $5.7 million for the first three months of the year 2002, compared to a

$17.6 million loss in the first quarter of the year 2001. [5] Revenues were $116 million, more than double the 2001 year's first quarter figure. Gross bookings rose to $1.1 billion.

In an article titled "Future Trend of E-Commerce",

> According to the U.S. Commerce Department, e-commerce is projected to be the primary economic growth for the U.S. over the next 100 years. Information Technology (IT) businesses still contribute less than 1% of the country's overall economic production, but they are growing more rapidly and provide more evidence that e-commerce will be the engine for economic growth in the next century [6].

Another report by Beth Cox pointed out that:

- 72% of web sites are still based in the U.S.
- 92% of e-commerce is generated through US-based Web Sites
- Exports are becoming increasingly critical to U.S. e-commerce growth. [7]

Overall, all of the reports suggest that e-commerce is growing very fast in the U.S. and will be the engine for economic growth in the next century. Meanwhile eMarketer predicts that one-half (over 60 million) of Net users over the age of 14 will purchase goods and services online by the end of 2002, and the figures will increase steadily [8]. In 2001, Business-to-Consumer (B2C) e-commerce sales totaled $49.8 billion, and eMarketer projects that online sales will grow to $75 billion in 2002 and reach $155.6 billion by 2005. [8]

A. E-COMMERCE IN CANADA

In a roundtable report on the state of e-commerce in Canada held in Ottawa, March 25, 2002 it was concluded that:

> Canada continues to lead North America in connectivity, with the percentage of Canadians online reaching 60% in 2001. [9] By comparison, only 52% of the U.S. population is online. Despite this lead in connectivity, Canada's consumers continue to purchase online much less readily than their counterparts across the border (only 17% of the Canadian population purchased online), far less than 27% of the U.S. population that purchased online in 2001. [9]

The growth of e-commerce in Canada is continuous. According to IDC, Canada had U.S. $15.6 billion. Meanwhile, medium and small sized Canadian enterprises' e-business adoption continues to move slowly behind their U.S. counterparts. [10]

To summarize, North American e-commerce is the leader in world online transactions (B2B and B2C e-commerce) and is also forecasted to continue leading the "dot.com" transactions by 2004 as shown in Table 1 below. [11]

	2000	2001	2002	2003	2004
North America (in U.S. Billion)	$509.3	$908.6	$1,498.2	$2,339.0	$3,456.4
United States	$488.7	$864.1	$1,411.3	$2,187.2	$3,189.0
Canada	$17.4	$38.0	$68.0	$109.6	$160.3
Mexico	$3.2	$6.6	$15.9	$42.3	$107.0

Table 1. North American E-Commerce Growth. (From: Forrester Research)

B. E-COMMERCE IN EUROPE

According to a report by Data Monitor (NUA, June 1999) [6], e-commerce also marked an exponential growth in western European countries. The report identified Germany, Britain and France as the top three consumer online shopping markets in Europe. The same report estimates that western European consumers online will increase to U.S. $8.6 Billion by 2003. Experts at IDC conference held in Prague (NUA, June 1999) predicted that there would be steady growth in e-commerce for Eastern Europe. However, according to the U.S. Department of Commerce e-commerce in the European Union, particularly B2C is handicapped by some different member state approaches to its regulation, high telecommunications costs, and a lack of consumer confidence [12]. However, there are some initiatives at the European Union level that will positively affect the e-commerce market in member states and will shape it in ways business cannot ignore.

The same report shows that e-commerce in Austria is becoming popular, and about 15 percent of Austrian Internet users made at least one purchase via the Internet in 2000. The report expects that Austrians will purchase more than $2.2 billion in goods

and services via the Internet by the end of 2002. The latter expectation will increase total Austrian online consumption to $1.5 billion at the end of the same year.

In Belgium, trade resources reveal that B2B e-commerce and B2C e-commerce have seen rapid increases. According to the U.S. Department of Commerce report, the total e-commerce market in Belgium in 1999 was $186 million and is expected to grow to $13.8 billion by 2004.

Although Denmark is among the countries that have the highest computer usage measured per capita, B2C e-commerce is still slow and according to the U.S. Department of Commerce report is not expected to represent any significant share of consumer trade. The good news is that B2B e-commerce is expected to grow rapidly.

In France, B2B e-commerce has increased considerably. Its sales currently account for more than 75 percent of total e-commerce revenues. In the meantime, B2C e-commerce has been less dynamic than B2B e-commerce.

Germany's e-commerce market is among the most developed ones. The e-commerce share of Germany's $334 billion trade volume however it still below one percent (1%). B2C e-commerce in Germany is leading Europe, according to a study mentioned in the U.S. Department of Commerce report, 51 percent of Germans with Internet access realized at least one business transaction via Internet. The U.S. report adds that "Germany will continue to dominate web advertising in Europe, with its share growing from $272 million in 2000 to almost $2 billion in 2005". [13]

To sum up, the growth of e-commerce in Western Europe will be significant, with even more significant growth in Eastern Europe driven by expected new technologies and solutions. Forrester Research predicts more improvements in Western Europe's online transactions by 2004 as illustrated in Table 2. [11] This prediction seems to be less optimistic toward the rest of the West-European countries (not mentioned in Table 2), but inferred from the Table 2 and added to it with the label other countries (Table 2).

	2000	2001	2002	2003	2004
Western Europe (U.S.$B)	**$87.4**	**$194.8**	**$422.1**	**$853.3**	**$1,533.2**
Germany	$20.6	$46.4	$102.0	$211.1	$386.5
United Kingdom	$17.2	$38.5	$83.2	$165.6	$288.8
France	$9.9	$22.1	$49.1	$104.8	$206.4
Italy	$7.2	$15.6	$33.8	$71.4	$142.4
Netherlands	$6.5	$14.4	$30.7	$59.5	$98.3
Other West European Countries	$26	$57.8	$123.3	$240.9	$410.8

Table 2. European E-Commerce Growth. (From: Forrester Research)

Meanwhile**,** eMarketer finds that e-commerce is moving forward in its "Europe E-Commerce" report. [14] This report covers 12 countries that eMarketer considers to be "core" to the region's online markets. The same source provides revenue forecasts from different sources for B2C e-commerce. The Forrester Research and the Yankee Group seem less optimistic about the future of B2C e-commerce revenues in Europe as shown in Table 3.

	2002	2003	2004	2005	2006
eMarketer, 2000	$37.07	$81.83	$182.54	-	-
European Information Technology Observatory (EITO), February 2002	-	-	-	$207.78	-
Forrester Research	$29.10	-	-	-	$135.00
Gartner G2, March 2002	$85.00	-	-	$225.00	-
International Data Corporation (IDC), September 2001	$46.33	$79.68	$167.92	$253.20	-
Yankee Group, March 2001	$20.10	$30.30	$49.45	$73.02	$92.06

Table 3. Comparative Estimates: B2C E-Commerce Revenues in Europe, 2000-2006 (In Billions). (From: eMarketer June 2002

C. E-COMMERCE IN ASIA

According to IDC, e-commerce revenues in Asia will not come close to the levels in the U.S. or Europe. Sales are expected to reach US$32 billion by 2003 (400% annual

increase) [15]. However, it is still small compared to e-commerce sales in the U.S., which are expected to hit US$ 500 billion by 2003.

Analysts predict that in three to four years time from 1999, half of the entire e-commerce transactions carried in the world will be outside the U.S. According to the research firm, Gartner Group, Asian e-commerce is predicted to reach $340 million by 2003. [15] The proportion of transactions carried over the Internet is anticipated to swell up to $1.3 trillion by 2003. [15]

Meanwhile, eMarketer reports that B2B e-commerce is rapidly expanding in most Asian countries. [14] The same source projected that Total B2B e-commerce revenues will increase from $36.2 billion in 2000 to over $300 billion in 2004 as shown in Table 4. The same table shows that eMarketer is less optimistic about the future e-commerce revenues in Asia.

	2002	**2003**	**2004**
eMarketer	$120.3	$199.3	$300.6
Computer Economics	$1,423.6	$2,095.1	-
Forrester Research	$266.3	$672.8	$1,532.7
Goldman Sachs	$119.7	$242.4	$1,047.2

Table 4. Comparative Estimates: B2C E-Commerce Revenues in Asia, 2000-2004 (In Billions). (From: eMarketer July 2001)

In Japan, B2C e-commerce trade, according to a survey done by the International Trade and Industry's Ministry and Anderson Consulting in 1998, accounted for 0.02% of the total household expenditure. While the next five years will see rapid growth in e-commerce which is expected to generate over one trillion Japanese Yen in revenue by 2003, such trade will still only account for just 1% of overall household expenditures [6]. However, eMarketer claims that China will challenge Japan's status as the Asian country

with the most Internet users by 2004. It argues that the expected growth of the Chinese population online to 17.4% of Asia's total population online (173 million) will shrink Japanese population online from the current rate of 36% of Asia's online population to only 18.5% by 2004. [16]

According to "zdnet news", China remains a distant second to the United States in international Web traffic. Chinese Web surfers overtook Japanese, despite Japan's higher number of individual users, because the Chinese have become more active users of the global Internet [17].

Finally Forrester Research [11] predicts blooming online transactions in Asia and the pacific counties by 2004 as shown in Table 5. [11] The same table gives an idea about the countries considered as "core" countries in online transactions; the other predicted countries' e-commerce growth is inferred from Table 5 and added to it as other countries.

	2002	2003	2004
Asia Pacific (U.S.$B)	**$286.6**	**$724.2**	**$1,649.8**
Japan	$146.8	$363.6	$880.3
Australia	$36.9	$96.7	$207.6
Korea	$39.3	$100.5	$205.7
Other Countries	$63.6	$189.4	$356.2

Table 5. Asia Pacific E-Commerce Growth. (From: Forrester Research)

D. E-COMMERCE IN AFRICA

In Africa, e-commerce activities are more or less concentrated in some countries such as South Africa, Egypt, Morocco, and Tunisia, reflecting higher levels of Internet penetration, awareness, regulatory platform, and developed telecommunications infrastructure.

B2B e-commerce is more widespread in Africa. It has been used mainly to stimulate the countries' exterior commerce and exporting [18].

Consultants Qmars Safikhani and Elinor Rowell [19] expected improvements in connectivity for all the African countries. They will come on in "leaps and bounds" in the next four years. According to the same source Tunisia is leading (in 2001) its neighbors in Internet penetration with an adoption rate of 2.9 percent, followed by Egypt with a rate of 2.1 percent, Morocco with a rate of 0.82 percent, and Algeria with an Internet penetration rate of 0.28 percent.

The same source projects that Tunisia, regardless of the fact that it will see the smallest factor increase in Internet penetration level of 12.6 percent (4.3 times its current level) rate by 2005, will continue to lead these countries in the Internet adoption rate [19]. Egypt is estimated to have a penetration rate of 11.9 percent, Morocco is projected to have a 10.5 percent penetration and Algeria is expected to increase its penetration rate to 9.3 percent in 2005. However according to the same source of information, Egypt will have by far the largest market for e-commerce and m-commerce (electronic transactions using mobile communication equipment) in 2005, worth $4.89 billion and $64.81 million respectively.

Meanwhile Morocco, with revenues (2001) from e-commerce and m-commerce near zero, is expected to realize more advances over the next four years. Its revenues are projected to amount to revenues of $1.17 billion for e-commerce and $11.52 million from m-commerce [19].

According to the Organization for Economic Cooperation and Development (OECD),

> the promise of significant economic growth places electronic commerce high on many public and private sector agendas [20]. And to date, the growth has been impressive. Starting from basically zero in 1995, total electronic commerce is estimated at some $26 billion for 1997; it is predicted to reach $ 330 billion in 2001-2002 (near term) and $ 1 trillion in 2003-2005 (future). These estimates are very speculative and rank among the highest of the dozen estimates generated by various management consultancy or market research firms.

In the same report, OECD estimates that at least 78% of all e-commerce revenues up to 2001 are generated in B2B e-commerce transactions [20].

To conclude, e-commerce is growing worldwide and will achieve more success in the future. Forrester Research projects $6.8 trillion worldwide online commerce (both business-to-business and business-to consumer) growth for 2004. [11] The predictions "Worldwide E-Commerce Growth" were summarized in Tables 1, 2 and 5.

However, there are some important issues such as security and customer's mistrust that need to be tackled in depth in order to guarantee such predictions. According to Taylor Nelson Sofres Interactive (Taylor Nelson Sofres is one of the world's leading market information groups active in Americas, Asia Pacific, Europe and the Middle East)

> Globally the biggest reasons behind the abstention from online shopping continues to be security related with 30% (up by 5%) of abstainers stating that they didn't want to give credit card details and 28% citing general security concerns [21].

Electronic commerce starts having considerable impact on the structure and operations of the markets around the world. Furthermore, it is apparent that e-commerce is a potential way for new employment generation. This is a crucial area for future growth and competitiveness. Driven by corporate players, Internet commerce around the world is experiencing an unprecedented growth. Small companies worldwide are enjoying access to world markets at the same level as multinational corporations do. At this stage, North America is leading the world's e-commerce. E-commerce in Europe is blooming significantly. Similarly, Japan and the Asia/Pacific region also are rapidly catching up. Spurred by industry and government, these countries are enjoying huge growth in Internet connectivity and electronic commerce.

The phenomenon e-commerce is spreading around the world, though it is not surprising to find that this "welcomed virus" already blooming in the Tunisian country and growing proportionally as it does around the globe.

II. INTRODUCTION

A. PURPOSE OF STUDY AND MOTIVATION

Tunisia has encouraged the effective use of information technologies, including the Internet by making them widely accessible. The government started an action plan in 1997 to spread Internet connections to university institutions and research centers, colleges and preparatory schools. The penetration rates are 100% for the Tunisian Universities and high schools, 10% for the Tunisian elementary schools and 40% for the Tunisian preschools as shown in Figure 1.

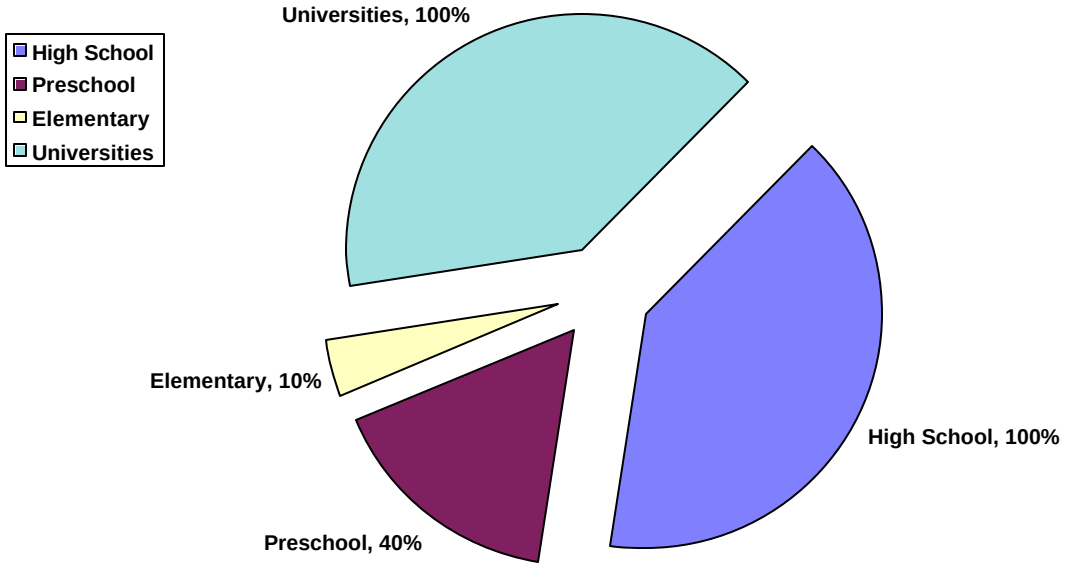

Fig 1. Tunisian Internet Penetration Rate

Figure 1. Tunisian Internet Penetration Rate.

In addition, there was a launching of public Internet centers (PubliNets) by the government (in October 1998) for two purposes:

- To ensure a great penetration of Internet services in all regions of Tunisia and all the Tunisian social layers
- To create jobs for young university graduates

This project consists in setting up Internet public centers (PubliNets) in every point of the Tunisian country. To encourage young entrepreneurs, the government

contributes to the 100 first projects by supplying grants covering 50% of the cost of the equipment and the rest of the amount is covered through bank loans carrying low interest rates. For other public centers (PubliNets), coming after the first 100, funding would be payable by the promoter-active supporter. Today, there are 300 licensed public centers (PubliNets) in operation. Every public center (PubliNets) is linked to the Internet network via one of the seven points of presence (POP) of the national backbone through a leased N*64 Kbps-line in order to ensure good quality service. Each public center (PubliNet) offers access to the web and e-mail accounts to the widest number of users, especially those who cannot afford to have one, by paying about $1.20 for one-hour use.

Actually those public centers (PubliNets) are playing a vital role in boosting access to the Internet and its applications such as the promotion of electronic commerce in Tunisia since executives and entrepreneurs frequently visit them to seek business information or to communicate with partners throughout the world [22].

Moreover, and as part of a national strategy devised by the president himself to guarantee universal access to the Internet and to inculcate the new ways of wealth derived from the Internet applications among groups and levels of the Tunisian society, the government launched The "7th of November" Internet Bus aimed at securing access to the World Wide Web for young people in rural areas and remote regions of Tunisia. Assembled at the Tunisian company of Automobile Industry (STIA), this bus is managed as a modern classroom with: thirteen (13) portable microcomputers, one of which is for the trainer, a proxy server, a shared printer, a screen and a video-projector connected to the trainer's computer.

Computers are connected to the server and have access to the Internet through an 11-megabyte wireless network. Another initiative announced by one of the Internet Service Providers in Tunisia, "PlaNet", is a tentative measure to boost the use of the Internet and its e-commerce application by the distribution of prepaid internet cards that allow the user to navigate the web without being a subscriber or a previous user.

The number of Internet subscribers in Tunisia increased in an exponential way. As shown in Figure 2, in December 1999, there were about 22,290 Internet subscribers in Tunisia's population of around 9 million. In August 2001 more than 59,551 were

Internet subscribers. That number rose to 75,000 subscribers as of June 2002 with the number of active users at more than 455,000. [23] The Internet community for electronic commerce projects and services in Tunisia will be about 600,000 users by the end of the year 2002. (It is assumed that active Internet users will reach more than this number since the number of public centers (PubliNets) is increasing) [23]

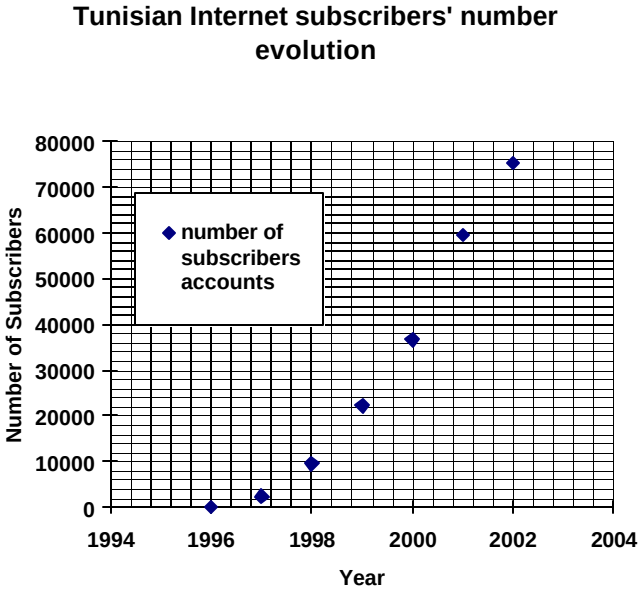

Figure 2. Tunisian Internet Subscriber's Evolution.

Among the measures taken by the government to accelerate the growth of Internet use and its applications such as electronic commerce, was the lowering of the prices (as shown in Table 6) of the Internet connection and phone access. In January 2001 the tariffs for connecting to the Internet network and communicating through the Tunisian public networks of telecommunications (Publitel) were reduced as follows:

- Tariff for a family subscription from 21 Tunisian dinars (TND) (about $16) to 10 Tunisian dinars (TND) (about $7) per month.
- Tariff for a professional subscription from 46 Tunisian dinars (TND) (about $33) to 20 Tunisian dinars (TND) (about $14) per month.

Tariffs for communication through the public networks were also revised downwards as follows:

- Normal tariff (from 7:00 am to 8:00 pm, except Sundays) from 0.03 Tunisian dinars (around $0.02) to 0.02 Tunisian dinars (around $0.014) per minute.
- Reduced tariff (from 8:00 pm to 7 am all days including Sundays from 0.02 Tunisian dinars (around $0.014) to 0.014 Tunisian dinars (around $0.01) per minute. Even the tax applied to the services of Internet was reduced from 18% to 10%. [24]

Communication Type	**Normal Tariff (in TND)**	**Reduced Tariff (in TND)**
Local Communications		
The First 1200 mn/quarter	0.010	0.010
Beyond 1200 mn	0.020	0.014
Inter Zone Communication		
From 50 to 100 km	0.120	0.084
Beyond 100 km	0.150	0.105
Overseas Call	The same tariff for fix and mobile phones	
Countries of the Maghreb Arab Union	0.540/mn	0.486/mn
Arabic Countries	0.900/mn	0.810/mn
North and West Europe Countries	1.080/mn	0.972/mn
Mobile Phone Tariffs		
Normal Tariff	0.250 (GSM)	0.200 (RTM)
Reduced Tariff	0.175	0.140
* Countries of the Maghreb Arab Union are Algeria, Libya, Mauritania, Morocco, and Tunisia		

Table 6. Shows Additional Reductions in Local Communications, Inter-Zone Communication, Overseas Calls and Mobile Phone Tariffs. (From: Tunisian Infocom June 2002)

Electronic commerce requires a reliable telecommunication infrastructure that makes possible a high quality of service. Internet connectivity in Tunisia has improved significantly since the national connection evolved from 19.2 with “Eunet” to 512 Kbps in 1996 with “U.S. Sprint”. This link was 13 Mbps in 1999, 40.5 Mbps by the end of the 2000, and now this connectivity has reached 75.5 Mbps. [25]

The Tunisian government believes that the information highway is one of the main roads that can lead Tunisia's economy to greater efficiency and better prepare the country's children to meet tomorrow's challenges.

On March 22, 1997, legislation for managing, organizing and governing the use of the Internet in Tunisia including the rights and the obligations of Internet Service Providers (ISPs), and customers was established and implemented. These laws, (Electronic Exchange and Electronic Commerce, and Digital Signature Law) based on the uniform law proposed by the U.N. Commission on International Trade Law (UNICITRAL), aim to furnish access to Internet services to all who want it, at the same quality in order to stimulate the private sector, within an open competition, to commercialize Internet access services and develop web-site hosting capacity. These laws were enacted on August 9, 2000 for the general organization of electronic exchanges and electronic commerce. The laws also govern electronic contracts. They cover electronic contracts' legal power, validity and their execution liability. A completely secured virtual currency, the e-tijara (for users of MasterCard and VISA credit cards) for business-to-business e-commerce transactions, and e-Dinar, allowing payment for goods and services purchases carried out on the Internet from Tunisian trade web sites, was launched by the Tunisian Internet Agency (ATI) in cooperation with major Tunisian banks. This payment model is based on the latest in secured commerce transactions. Together "credit card" of the Internet and Secure Socket Layers (SSL) are a winning combination to make Tunisian e-commerce a safe environment for everyone.

The goal of this thesis is to establish the key elements necessary for the effective implementation of electronic commerce as a tool for Tunisian economic growth and to examine ways to stimulate Tunisian electronic commerce growth through foreign investments in the marketplace.

The lessons drawn from the Tunisian experience would be of significant interest to other developing countries that are in the process of introducing or expanding their use of electronic commerce to stimulate economic growth.

1. Background

The history of the Internet and electronic commerce in Tunisia started in 1989 when a first node using X.25 link was installed. In 1991, Tunisia was connected to the Internet. The Tunis-based Regional Institute for Computer Sciences and Telecommunications (IRSIT) set up an IP connection on X.25 leased line with the French Institute for Research in Computer Science and Control (INRIA). In 1993, the government launched the National Research and Technology Network (RNRT) to offer Internet access to research centers at Tunisian universities. In March 1996, the Tunisian Internet Agency (ATI) was established to boost and manage Internet services. Also Tunisian institutions started publishing general information about the country in a few websites. At the same time, two newspapers launched an Internet version of their daily publications. On 30 December 1996, the Tunisian National Radio started broadcasting live on the Internet 24 hours a day. In March 1997, the Ministry of Communications gave the green light for the creation of Internet Service Providers (ISP) to offer Internet access to public and private sectors. By 1998, the number of ISPs in Tunisia reached nine companies and centers. In November 1997, an electronic commerce taskforce (from the government and the private sectors) was established to study the implementation of e-commerce in Tunisia. This commission (National Commission for Electronic Commerce and EDI (CNCE) focused on studying the logistical and legal issues of online trade and reported its recommendations to the government. In March 1999, the National Commission for Electronic Commerce and EDI (CNCE) presented its report on the implementation of electronic commerce in Tunisia. Two months later, the government announced decisions aiming to prepare the grounds for e-commerce. Six pilot projects about various Tunisian-made products and services were launched online. In December 1999, an Electronic Exchange and Electronic Commerce Bill were submitted to the Parliament. In the first quarter of the year 2002, the government sent out a decree for the creation of a national certification agency (whose role is to grant authorizations to digital certification service providers and control the applications of the legal dispositions related to e-commerce etc.), and a schedule of conditions for certification service providers [26].

2. How the Geographical Position of Tunisia Would Affect Tunisian E-Commerce?

Tunisia covers an area of 63,378 square miles (162,155 km2) and has about 800 miles (1,300 km) of coastline on the Mediterranean Sea stretching along the north and the east of the country. It is bounded by the Mediterranean Sea from the North and East, Algeria from the West, and Libya from the south. There are three large regions in the country: the grain-growing plains in the northwest; the Sahel, olive tree area, on the east coast; and the Sahara region in the south. Temperatures in Tunisia's Mediterranean climate range from 11.4 to 29.3 degrees Celsius (52.5 to 84.7 degrees Fahrenheit) with cold, rainy winters in the north and semi-arid conditions in the interior and the south. The geographical position of Tunisia makes it the destination of over 4.5 million European tourists a year (most of them Germans, Italians, French and Spanish). Since the atmosphere and the environment of electronic commerce are ready for them, the majority of these tourists come to Tunisia equipped with their laptops, and cellular phones, so they can conduct business while on vacation.

3. Economy

The past decade has witnessed an emergence of major regional trading blocks and a growing tendency to liberalize the economy and adopt the market system as the basis of economic organization, management and policymaking. The economy has been growing at an average of 5.8%. Inflation has been pegged down to 2.9% in 2000. The budget deficit has been whittled down to 3% and hit a low of 1.8% in 2001. Mr. Tahar Sioud Tunisian Trade Minister said "this is mainly due to the fall of the price index by half (from March 2001 compared to the same period 2000) due to sales." The balance of payments deficit has stabilized at around 4.2% and external dept is no more than 17% of exports [27].

In light of these developments, and after being a member of numerous trade organizations such as the World Trade Organization (member of the GATT on April 1990), Tunisia signed an association agreement with the European Union in 1995. This agreement required immediate elimination of protection on capital imported goods from the European Union (EU), which did not have competitive locally produced goods and which represented 12 percent of imports from the European Union (EU). Setting up a

free trade area with the European Union (EU) by 2008 is one of the major goals of this agreement. This is considered the most efficient way to reinforce relations between the signatories as it will create greater growth opportunities and attract more foreign direct investments. However, if economic liberalization allows growth opportunities for the national economy through increased market size and trade, capital mobility, reorganized economic activities, and easier information technology transfer, it also creates serious challenges.

To pass these challenges, the Tunisian government decided to upgrade globally the Tunisian economy (which specifically stands for the all-round improvements necessary if Tunisia's economic performance is to come to par with that of Europe by 2008). Particularly the industrial and information technology sectors became Tunisia's main economic goal.

To achieve this goal, the government has commenced with an ambitious upgrading program. "We began the process in 1996" says Mr. Mohamed Gannouchi, former minister of Tunisian international cooperation and foreign investments, and actual prime minister.

> There are several prongs to the program: we have to upgrade our infrastructure, the financial and regulatory institutions, communications and administration. Through government subsidies, we have to push the private sector into greater efficiency, cut the costs of production, open up capital to foreign investors and make companies more responsive to market demands. Finally, we have to inculcate a new culture of productivity and creativity among the workforce. [28]

Up to now around 1,330 Tunisian industrial companies have utilized this program, mobilizing a total additional investment of around 1,200 million Tunisian Dinars (around U.S. $814 million). The fruits of these upgraded programs have started to be felt today: 82% of Tunisian exports are made of manufactured products (each manufacturer with its proper web site participates in promoting the business-to-business e-commerce), besides there is an increase in employment as well. This fact, according to Mr. Abdessalem Htira, Tunisian Ambassador in Malta, increased the Tunisian level of savings and investments attracted more foreign direct investments and accelerated the privatization program [29]. "The foreign investment climate in Tunisia is excellent at the

moment (March 1999) and it can only get better as the economy shifts up the gear," said the Prime Minister Mr. Mohamed Ghannouchi [30]. Besides, as an illustration to the growth of the "first e-commerce driver", today Tunisia has more than 2,330 foreign direct investments which resulted in a rate of 200 foreign investments in 2001 compared to the rate of 90 foreign investments per year in the beginning of the 1990s (with only 800 foreign investments) [31].

These foreign investors are wholly exporters with their own web sites. Also, this upgrade pushed the industrial companies and the investors to widen the delivery of their goods through the use of e-commerce.

Tunisia's goals for the future in terms of trade will be mainly centered on the implementation of the partnership agreement signed with the European Union which calls for the creation of a free trade area and the strengthening of economic relations between the two parties. At the same time, efforts will continue to harmonize the trade agreements with various partners, particularly the members of the Union of the Maghreb Arab (UMA) and other Arab and Mediterranean countries such as Malta. This tendency requires and even pushes all the partakers in Tunisia to boost the use of all the tools and particularly e-commerce.

For Tunisia, trade is a vocation. The country has a deep-rooted tradition of trade and exchanges with other nations. The Carthaginians reputation as skillful tradesmen was unequalled. As the heir of Carthage, modern Tunisia continues to hold foreign trade in the forefront of its economic agenda. This means that the Tunisian people are predisposed and well prepared to boost the use of e-commerce in their daily life.

Another worthwhile project is the "tradeNet" launched by the Ministry of Commerce as an online documentation and financial service for importers, exporters, and freight organizations. "This secure and convenient service will cut down on process delays in international shipping and help grow other business-to-business e-commerce market spaces" said Mr. Karim, Gharbi, director of TradeNet Tunisia [32].

4. Information Technology

The second challenge of Tunisia's economic revolution involves the reform of the Tunisian telecommunications' industry. In this context, and according to the Office of

Telecommunication Technologies-International Trade Administration, U.S. Department of Commerce, U.S. exports of telecommunication equipments to Tunisia were valued at $3.94 million in 2000, up 31 percent from $3.0 million in 1999. [33]

Table 7 shows the development of Tunisian telecommunication through the years. This improvement is an important driving factor in the adoption of the Internet and e-commerce in Tunisia.

Concerning the network infrastructure, Tunisia relies on satellite networks and is also connected to the SEA-ME-WE-2 submarine fiber optic cable. According to the same source (Office of Telecommunication Technologies-International Trade Administration, U.S. Department of Commerce), and as part of Tunisia's Ninth development plan (1997-2001), Tunisian Telecom announced a variety of projects to further upgrade and expands its telecommunications infrastructure, totaling over $1.6 billion. "The first of these expected equipment tenders was a project for the expansion of Tunisia's fiber optic and terrestrial microwave network" [33]. Tunisian Telecom also launched several projects via international tenders such as the Asynchronous Transfer Mode (ATM) frame relay data transmission network, digitization of the Arabic Satellite (Arabsat) land station, and the expansion of the cellular phone network into the interior of the country.

According to the Office of Telecommunication Technologies, International Trade Administration, U.S. Department of Commerce, The Tunisian Internet Agency (ATI) also has two Internet fiber links to provide access to the Internet Service Providers. The first is with Telecom Italia, which is, in turn, linked to the Internet backbone by "Teleglobe of Canada". The second link is to the U.S. backbone via Sprint. Numerous public and private online services allowing Tunisian citizens to take advantage of e-commerce are being introduced. For example, electronic currency known as the e-Dinar was implemented in August 2000.

Year	1996	1997	1998	1999	2000	2001	2002
Number of phone subscribers (in thousands)	585.0	654.0	752.0	850.0	955.0	1,056.0	1,200.0 (as of April 2002)
% of phone density	6.5	7.1	8.3	9.5	11.7	15.0	15.21 (as of March 2002)
Rate of digitization in%	86.0	90.2	99.7	100.0	100.0	100.0	100.0
Number of mobile phone's subscribers	6,500.0	7,656.0	38,998.0	55,258.0	119,075.0	389,208.0	
RTM	6,500.0	7,656.0	8,400.0	11,938.0	15,090.0	13,298.0	
GSM			30,598.0	43,320.0	103,985.0	375,910.0	
number of international roaming operators			41.0	69.0	84.0	100.0	
% penetration rate of TV broadcasting	98.5	98.7	98.7	99.0	100.0	100.0	100.0
Internet subscribers accounts	111.0	2,407	9,592	22,290	36,657	66,000	75,500 (as of June 2002)
Active Internet users	-	-	-	150,000	260,000	410,000	455,000 (as of June 2002)
Number of computers	-	128149	153967	196816	207874	229882 included household computers	-
Source Infocom & ATI & Statistical National Institute (June 2002)							

Table 7. Tunisian Telecommunication's Evolution.

To enhance the creation of an IT culture, all high schools and universities have compulsory computer science courses. Over the last two years, all research centers, universities, libraries and high schools have been, or are being, connected to the Internet. As a matter of fact, to concretize the immaterial economy and inculcate more efficiently the "dot.com" culture, the government launched the first online university enrollment project for five universities for the academic year 2000-2001, and 12 universities in 2001-2002. A virtual library and a web auction managed by the Ministry of Communication

Technologies were launched as well. By the end of the next development plan (2002-2007), all primary schools will be connected.

At a higher level, the intensive training of graduates in all aspects of information technology is rapidly creating a core of experts. Seven companies specialized in software development (Cynex Software, Alcatel, BFI, IRSIT, OmniaCom, Pico Soft, Archimed) and employ more than 300 engineers and high level technicians. Software designed in Tunisia has been successfully sold to several multi-national companies such as Northern telecom and the French company "General Society". According to a Report Prepared by the Washington Times, the software development company Cynex specialized in telecommunication systems and has an ISO 9001 certified software development process. "Ninety percent of Cynex's customers are in the United States [34]. As an indication of the growth of the sector, the number of employees has grown 10 times over the past two years" [34].

According to Mr. Hammouda Hamdi, Secretary of State at the Ministry of International Cooperation and Foreign Investments, the revenues from this export are about 50 Tunisian million dinars (about U.S. $36 millions) each year [31].

Tunisia also has companies which assemble hardware (operating systems and servers) based on Linux [35] both for domestic consumption and exports [36].

Since January 2001, and to cope with the phenomenon of convergence in the telecommunications, media and information technology sectors, a new Tunisian Ministry has been created under the authority of which all telecom and computer structures operate: The Ministry of Communication and Technologies. The Internet Tunisia Agency (ATI) (established in April 1996, with "Tunisian Telecom" owning 51% of its shares and private investors owning the rest) part of the Ministry of Communication and Technologies was given the task to manage and improve the use of the Internet and its applications, specifically e-commerce, to affect the economy.

The Tunisian government formulated a clear strategy:

- Creation of the Tunisian National Commission for Electronic Commerce and EDI to study the various aspects of electronic commerce (e.g., legal, commercial, financial, tax, security)

- Revising the different procedures connected with foreign trade in order to boost exportation via the Internet network and facilitate the action of electronic commerce operators
- Launching pilot projects that will open virtual shopping centers to export
- Implementing a "strategy of awareness and training" via the organization of periodic study days answering the queries of all the people interested in e-commerce
- Putting the finishing touches to the legal framework regulating this activity so that Tunisian law will be in tune with this new mode of commercial transaction, particularly in regards to legalization of the electronic means of identification (digital signature and certification) and breaches of trust
- Creating a permanent ministerial committee, supported by a technical commission of experts and specialists, to guarantee permanent follow-up of the ministerial recommendations and ensure coordination among all partakers
- Development of Telecommunication and Internet infrastructure
- Generalization of Internet access
- Reducing the tariffs
- Studying legal issues for electronic commerce in Tunisia
- Creation of "one computer per household" program to encourage e-commerce in Tunisia

Today, electronic commerce is a reality in Tunisia. As part of a pilot project set by the government, dozens of companies have launched (May 1999) e-commerce services covering a wide range of Tunisian products including crafts, foodstuffs (dates, olive oil, and desserts), textiles, tourist services, stamps, and hotel reservations. Tunisian products are now sold around the world as illustrated in Table 8. Tunisian exports and market expenditure chart. The same table shows that Tunisian electronic commerce web sites record sales from various countries of the world, including the United States, Germany, France, Switzerland, Lebanon, Hong Kong, and Holland, and the goods are delivered within the deadlines. France and Italy are the leading clients with 28.9% and 23.2% of the total exports respectively. This has encouraged several other companies to launch their electronic commerce web sites within the framework of this pilot operation.

Major clients	Million Tunisian Dinar (TND)	(%) relative to total exports
France	2751.3	28.9
Italy	2207	23.2
Germany	1114	11.7
Belgium	464.4	4.9
Spain	460	4.8
Libya	357.5	3.8
Netherlands	233.9	2.5
United Kingdom	226.3	2.4
India	118.3	1.2
Iraq	84.3	0.9
Algeria	109.0	1.14
Turkey	73.3	0.9
United States	91.3	0.96
Iran	57.6	0.7
Morocco	58.7	0.62
Greece	43.7	0.5
Switzerland	50.8	0.53
Egypt	34.8	0.4
Saudi Arabia	33.4	0.35
Brazil	26.6	0.28
Other Countries	691.7	
General Total	9503.7	

Table 8. Exports and Market Expenditure. (From: Center for Promotion of Exports (CEPEX) and the Statistical Tunisian Institute 2001)

To generalize the use of this new mode of commerce in Tunisia, a creation of public and private online services allowing Tunisian citizens to take full advantage of electronic commerce was put into action by the government. Many important decisions such as revising the different procedures connected with foreign trade in order to boost exportation via the Internet network and facilitate the action of electronic commerce operators were made and implemented.

The government implemented a "strategy of awareness and training," via the organization of periodic study days on electronic commerce such as the campaign "Internet Caravans". This campaign concerned the benefits of Internet services and electronic commerce carried out on September 1999. The conference on the Internet applications and e-commerce held on November 9, 1999 targeted chief executive officers, chief information officers, and others parts from the public and private sectors. This strategy of awareness and training, together with the establishment of a regulatory and technical environment for electronic commerce will make Tunisia in tune with the new mode of commercial transactions, particularly in regards to legalization of the electronic means of identification (digital signature and certification) and people's readiness to use the new channel when they are assured there will be no breaches of trust.

A direct result of this general atmosphere of e-commerce is the emergence of trade exponentially as an important sector in the Tunisian economy. A lot of Tunisian goods reach the exterior markets in the world. Tunisia's foreign Trade in 2001 was marked by an 18.7% rise in export value amounting to 9,503.7 Tunisian Million Dinars (TMD). Export growth in 2001 is attributable to a boost in export performance recorded in the textile and clothing sector (51%), the electrical industries (22.8%) and the leather and shoes sector (26.8%). In consumer goods, there was a 19.5% rise in raw materials and semi-finished products and 7.2% increase in capital goods.

Tunisia's thriving economy has created an attractive atmosphere for investors from the European Community, Japan and the United States. More than 1,800 foreign firms have direct investments in or joint ventures with Tunisian companies. Many of these firms were attracted by Tunisia's proximity and preferential trading relations with the European Community and the Arab Maghreb Union, as well as by the Investment Code, which offers tax and customs concessions to foreign investors, and facilitates project approval.

B. STATEMENT OF RESEARCH QUESTION

The research question for this thesis will determine whether the widespread use of electronic commerce in Tunisia has promoted economic growth, expanded markets, increased efficiency and maximized wealth. The study analyses the nature of the relationship between Tunisian e-commerce growth and Tunisian economic growth, and

the process by which electronic commerce was conceived developed and implemented. This includes an examination of ways to stimulate Tunisian electronic commerce growth through foreign investment in the marketplace.

A series of inferences will be drawn from the data gathered by the e-commerce taskforce representing both government and private-sector bodies (ministries, trade associations, etc.) that was set up in November 1997. It was given the task of setting up electronic commerce strategy and infrastructure in Tunisia. These working groups have studied the various aspects of electronic commerce (legal, commercial, financial, security...), and the results of their studies will help answer the research question.

C. OPERATIONAL DEFINITION OF ELECTRONIC-COMMERCE

Narrowly defined, electronic commerce means doing business online or selling and buying products and services through Web storefronts. Products being traded may be physical products such as used cars or services (e.g. arranging trips, and remote education). Increasingly, they include digital products such as news, audio and video, database, software and all types of knowledge-based products. It appears then electronic commerce is similar to catalog shopping or home shopping on cable TV. E-commerce transactions fall into three categories:

- Business-to- business (B2B) e-commerce
- Business-to-consumer (B2C) e-commerce, and less commonly consumer-to-consumer (C2C) e-commerce

An e-commerce transaction may begin when a buyer views an online catalog and gets product or service information; places an order; and provides credit card and shipping information. The seller verifies the credit information, processes the order and payment, and schedules the shipping.

Whether we call it Internet commerce, or electronic commerce it usually refers to economic transactions. E-commerce, immerse, or e-com are used interchangeably, and they all mean the same thing — the paperless exchange of routine business information using Electronic Data Interchange (EDI), e-mail, electronic bulletin boards, fax transmissions and Electronic Funds Transfer. It refers to Internet shopping, online stock and bond transactions, the downloading and selling of "soft merchandise" (software, documents, graphics, music, etc.), and business-to-business transactions.

The term “electronic commerce” has evolved from its meager notion of electronic shopping to mean all aspects of business and market processes enabled by the Internet and the World Wide Web technologies. Most importantly, e-com can be made safe. Experts tell us that online transactions are every bit as safe as face to face transactions--although neither can be guaranteed to be 100% risk free.

1. Electronic Commerce as a Market

Electronic commerce is not limited to buying and selling products online. For example, a neighborhood store can open a Web store and find the world at its doorstep. But, along with customers, it will also find its suppliers, accountants, payment services, government agencies and competitors online. This online or digital partner’s demand changes the way companies do business from production to consumption. All companies will be affected, even those who might think they are not part of electronic commerce. Along with online selling, electronic commerce will lead to significant changes in the way products are customized, distributed and exchanged and the way consumers search and bargain for products and services and consume them.

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III. METHODS

A. DATA SOURCES

Existing data is the essential source of information in this study. Secondary data sources are often overlooked because it is assumed that attempts to determine an efficient study must rely on primary data sources. However, when time and resources are factors, existing records often provide the most sufficient and effective strategy.

Existing data refers to data acquired from secondary sources rather than from original data collection efforts [37]. In other words, this information was not provided for the purpose of the present study, but instead for other purposes. Three broad categories of existing records were used: existing data provided by the Tunisian embassy, records published by different agencies as part of their normal process of information, and archival data.

The majority of the sources of information in this study are from governmental agencies at local, national, or international levels. Some governmental agencies gather data regularly such as Statistical Tunisian Institute (INS), the Tunisian Internet Agency (ATI), the Ministry of the Economical Development, the Ministry of Communications and Technologies (Infocom), the exports promotion's center (CEPEX), Akhbar Tunis, Tunisia online, and the Tunisian Central Bank at the national level, the U.S. Department of Commerce, Net Figures Database, Organization for Economic Cooperation and Development (OECD), Regional reports on North Africa, and the International Trade Administration, (U.S. Department of Commerce) at the international level. Various other existing data were obtained from published reports on the World Wide Web.

There are advantages in using existing data such as:

- Availability and accessibility of data (the data is ready for use whenever we want; there is no waiting for data collection)
- Low cost (most of the time individuals have free access to data collected by Tunisian government agencies. The information can be obtained from the agency that collected the data, by searching the World Wide Web, or by finding it in a library that serves as a Tunisian government depository for government documents (e.g., college and university libraries and large public libraries).

- Comparative or longitudinal data may be available (for example, the prices of Internet access, and the adoption rates in all the different countries in the African continent which help to forge the most realistic study possible

Existing data may affect or even distort the main question that we are trying to answer, for example:

- If using agencies' records, the information will be driven by what those agencies publish and will limit the ability to analyze and answer a specific question
- If using published reports or data collected by outside sources, there will not be information about the partakers involved in the specific topic subject to evaluation

Published reports will not allow the determination of the impact of the evaluation on its actual stakeholders.

There are some constraints encountered when using existing records.

- Missing or incomplete data that may affect the overall accuracy of the information. Some information needed for the evaluation of Tunisian e-commerce is not available; limitations exist based on what information was collected.
- Depending on the source, some of the existing data are not in the format required (for example, not specific to the main research area. For instance, the data that was collected is mainly about the Internet in Tunisia, the adoption rate, the economy, and the exportation in Tunisia, but the research question is the relationship between the Tunisian e-commerce growth and the Tunisian economic growth). Or in an overly aggregated form (e.g., the intention was to break the Tunisian e-commerce evolution out by its different ingredients, but the statistics found are utilizing only report information of the global evolution of the Tunisian commerce, exportations and the economy as a whole).
- Unknown, different or changing definitions of data (concepts have not been defined and measured in the same way over time or across sources). This may affect the reliability and comparability of the information. One common example is the use of Internet and e-commerce. Some studies may describe only the Internet usage, while others may mix Internet and its different applications.

There are various sources of information collected and reported by governmental agencies that are accessible to the public. Statistics from these federal sources were applied to this research. Reports were obtained from the agency that collects the data, from the Tunisian embassy and the World Wide Web.

Some of the major statistical agencies of the federal government, which collect, compile, analyze, and publish data for general usages that may be especially applicable include:

- The statistical Tunisian institute (INS)
- The Tunisian Internet Agency (ATI)
- The Ministry of Communications and Technologies (Infocom)
- The center for Promotion of Exports (CEPEX)
- The Tunisian Central Bank

The other kind of data used is archival information (data that has already been collected within an organization such as the Tunisian Internet Agency (ATI). This information was analyzed to help answer research questions. Examples of Tunisian archival information in economic settings include the periodical commercial reports issued by the Tunisian Central Bank etc.

One of the advantages of using archival data is that it is readily available and can be accessed without intruding on any other means of research. It can also offer a wide sampling of economical information that may be pertinent to the research question. Meanwhile, among possible disadvantages, the standards under which the data is collected may change from year to year, making it difficult to compare directly data from different years (e.g., the Tunisian Internet connectivity).

All data sources are fully referenced, and any reader will be able to very quickly obtain the original data sets. The reference documents define the terms, cite the data sources, and discuss the accuracy, currency, and comprehensiveness of each source.

B. DATA COLLECTION

It is known that all information must be collected through some methods or procedure; we must also acknowledge that each method or instrument used has its own strengths and limitations. For example, existing data may not be the appropriate way to collect data on topics where the answer depends on various private parties that are involved. They never answer the intended queries, and if by chance they did, their responses may not be the actual truth. Still, all instruments and methods of data collection such as the technique called triangulation used in this study have a certain level of reliability and content validity (which seeks to determine whether the data and the

procedures that make up the assessment contain the right "ingredients" to answer the research questions or measure high level concepts. The use of multiple methods (triangulation) in this research appeared to be a beneficial approach for data gathering.

1. What is Triangulation?

> Triangulation is a term borrowed from the study of experimental methods and refers to any attempt to investigate a phenomenon using more than one method. It was developed to counteract the inherent threats to validity that each experimental method contained [38].

2. Triangulation Methodology

The triangulation methodology (known as methodological pluralism) requires using a variety of methods in collecting data. It was a mixture of personal choice and lack of meaningful data to answer the research questions that resulted in pursuing this work openly utilizing a blend of methodologies for data collection so as to enhance the relevance and worthiness of the study. The common following strategies taken into account in gathering the data were [39]:

a. Credibility

The degree of correspondence (isomorphism) between findings, the raw data collected from existing records and the objective reality were respected.

b. Dependability

The research data is traceable and documentable.

c. Trustworthiness Criteria

These criteria for judging the quality of the data focus on the rigor of the data collection including data filtering, validity, reliability and objectivity (without any biases, alien values and prejudice).

3. Internet Economy

Several methods of data collection were used to collect the estimates of the Internet economy. Phone-based and face-to-face interviews were conducted with the agencies charged with the economical section in the Tunisian embassy. In addition, there was analysis of some literature and web sites of some large U.S. companies such as Amazon.com, Cisco systems, Dell, and IBM to develop a solid understanding of how they fit into one or more of the four layers of the Internet Economy.

A lot of estimates for Internet companies were developed from several web-based databases and final Internet economy revenues were estimated using a combination of enumeration and statistical sampling, the fact of being (the researcher) Tunisian, familiar and knowledgeable with the Tunisian market, and some projection techniques.

C. DATA ANALYSIS

Once data collection is completed, data is analyzed using five major phases (data preparation, checking data accuracy, descriptive statistics, inferential statistics, and research assumptions). Research architecture was developed to answer the research question. Moreover there was an attempt to translate the questions into some measurable variables. This process helped to transform the research design into a statistical design.

1. Data Preparation

Cleaning and organizing the data for analysis includes checking the data for accuracy; transforming the data; and developing and documenting a database structure that integrates the various measures useful for this research.

2. Checking the Accuracy of the Data

To ensure that the data are accurate and have been peer reviewed by Tunisian official agencies, there was no use of any data provided by sources other than governmental in the study. Most of the data are taken from official sources either through the Tunisian embassy or collected from the governmental web sites.

D. ANALYZE

1. Descriptive Statistics

Descriptive statistics provide simple summaries about the sample and the measures. They have been used together in this study with Internet economy indicators to present quantitative descriptions in a manageable form. Descriptive statistics helped simplify large amounts of data in a sensible way. They reduced lots of data into a simpler summary.

2. Measuring the Internet Economy

The Internet economy relies on high speed Internet networks and Internet applications mainly e-commerce as a tool to increase efficiency and expand markets. Few efforts have successfully measured the economic growth and jobs created by this

emerging Internet economy, and come up with metrics and measurement understandable in analyzing issues involving the Internet economy.

The introduction and evaluation of the four layers of the Tunisian Internet Economy **(**Internet Infrastructure, Internet Applications, Internet Intermediary, and Internet Commerce) adopted by the U.S. Department of Commerce facilitate analyzing the quantitative relationship between the Tunisian e-com and the Tunisian economy [40].

Internet Economy Indicators with its two elements (the Internet Economy Revenues Indicator and the Internet Economy Jobs Indicator), sponsored by Cisco Systems and created by the University of Texas, may provide a solid foundation for conceptualizing and measuring the four basic layers [41]. The Internet Economy Indicators are designed to quantify the sales volume and employment in various groups of Internet-related products and services. They were used here for the same purpose mentioned previously.

3. The Four Layers of the Internet Economy [41]

a. The Internet Infrastructure Layer

Includes companies with products and services that help create the prerequisite for electronic commerce (an Internet Protocol based network infrastructure). The categories in this infrastructure layer include:

- Internet backbone providers
- Internet service providers
- Networking hardware and software companies
- PC and Server manufacturers
- Security vendors
- Fiber optics makers
- Line acceleration hardware manufacturers

b. The Internet Applications Layer

This layer is encapsulated in the above Internet Protocol network infrastructure and makes it technologically feasible to perform electronic commerce activities. The categories in this applications layer include:

- Internet consultants
- Commerce applications

- Web development software
- Search engine software
- Online training
- Web-enabled databases

c. The Internet Intermediary Layer

Internet intermediaries increase the efficiency of electronic commerce by facilitating the meeting and interaction of buyers and sellers over the Internet. The categories in this intermediary layer include:

- Market makers in vertical industries
- Online travel agents
- Online brokerages
- Content aggregators
- Portals/Content providers
- Internet ad brokers
- Online advertising

d. The Internet Commerce Layer

Internet commerce involves the sales of products and services to consumers or businesses over the Internet. The categories in this Internet commerce layer include:

- E-tailers
- Manufacturers selling online
- Fee/Subscription-based companies
- Airlines selling online tickets
- Online entertainment and professional services

4. Inferential Statistics

Inferential Statistics were used in this study in order to reach conclusions that extend beyond the immediate data alone by testing hypotheses and models. For instance, inferential statistics were used in a trial to infer from the sample data the eventual efficiency of e-commerce in Tunisia (more precisely the measured contribution of the Tunisian electronic commerce revenues in the Tunisian commerce as a part, and in the Tunisian economy as whole). They were used to make judgments of the probability

whether the Tunisian e-commerce growth and the Tunisian economic growth are correlational or one that might have happened by chance in this study as well. Thus, inferential statistics were used in this study to make inferences from the available data to more general conditions.

5. Research Assumptions

The following assumptions were used for compiling some of the research data:

- The scope of the research was not limited to companies that had revenues associated directly with the Internet. The study did include second or higher order impacts of the Internet economy (e.g., different sectors in the Tunisian economy generating revenues from pure Internet based companies).
- Some Revenues were calculated based on assumptions inferred from other existing results. In analyzing the Tunisian Internet economy, some companies are categorized into one or more of the four layers.
- In the absence of estimated total employments dedicated to Internet-related revenues generated from the companies evaluated, jobs were estimated relative to the existing employment statistics and the annual employment rate for previous years.
- The interpretation of data was done meticulously in order to assure that the results of the investigation are rooted in contexts and collected information other than the "imagination".

IV. RESULTS

E-Commerce benefits both the Tunisian consumer and the Tunisian shop owners. As consumers, we all understand the benefits this option can provide - the efficiency of time and money. According to some Tunisian web sites such as "Shopping gallery", "tourism", "mosaic", "TOP OLIVA", "handicrafts", "SOCOPA" and by the nature of being (the researcher) Tunisian (familiar with the different prices of goods present in the Tunisian market and able to compare the prices), products are offered at lower prices over the Internet. The reasons prices are lower are less overhead, increased choice and price competition. All these facts mean a savings to the consumer; plus the added convenience of processing the command (24 hours a day/7 days a week), and having his/her needs delivered to his/her home (which mean savings in time). While the same facts give sellers a new and potentially lucrative channel for unloading inventory, they (sellers) are turning to the Internet to grow revenues, and enhance the bottom line.

According to Akhbar Tunis more than 616 Tunisian domain web sites were visited during the first quarter of the year 2002. [42] And from the statistics provided by the Tunisian Agency of the Internet, the number of internet users in Tunisia and the statistical data about the commerce in Tunisia, we can infer that the sales transactions are quasi-uniform distributed all over the year except in summer season and some other events such as the end of "Ramadhan" and the beginning of the school year. During these later periods the sales increase a little more than the rest of the year. The majority of the users are between 15 and 51 years old, which promises a successful future adoption of the e-commerce phenomenon in Tunisia.

Tunisian enterprises of all stripes are expanding their markets locally and internationally. At the same time, they are taking advantage of the efficiencies that e-commerce web sites created for them. For instance, all the industries in Tunisia (more than 10,000 manufacturing companies) have their own websites. Approximately 2,000 manufacturing companies are wholly producing for the European, American and African markets and other countries as well. According to Akhbar Tunis, there are about 2,330 active foreign companies stationed in Tunisia versus only 800 companies at the beginning

of the nineties [31]. The same source added that the rate of foreign investments increased significantly from ninety companies per year (90/year) at the beginning of the nineties to two hundred companies per year (200/year) in 2001. These companies have reinforced the transfer of technology and contributed to the stimulation of e-commerce in the Tunisian country. This market expansion encouraged the government to enhance the trade by implementing the exportation promotion center (CEPEX online web site). This center provides an up-to-date export information service, including overseas markets, national and international statistics, market surveys, etc. The CEPEX web site represents an opportunity to market Tunisian products such as Tunisian olive oil, and other manufacturing products.

The exchanges have grown for sellers as well. They reached much wider local and foreign markets than they previously served. Buyers find a broader spectrum of suppliers than available through conventional sources. Whether on the selling or buying side, Tunisian exchange participants are virtually assured of the best prevailing prices for the products and services they are trading.

As a result, the growth in exports of Tunisian goods has contributed to an employed workforce. A basic characteristic of sound economic growth is the use of labor in export industries. Exporting generates large numbers of jobs for men and women (about 44% of job creations), including those with few skills. Recent statistics of the Tunisian employment show that the labor force has expanded rapidly in this country. Job creations exceeded, for the first time during the Ninth Development Plan (1997-2001), the threshold of 60,000 jobs per year. The computer and internet sectors by themselves provided more than 6,550 jobs without including the virtual employments created simply by practicing in virtual business through buying and selling via the internet [43]. This number did not include the new jobs created by the new Internet public centers whose number reached 3,000, and other new employments resulting from the development of the Internet and its applications since 2000. The unemployment rate is significantly decreasing and reached a rate of 15% in 2001 after being 15.6% in 2000 as shown in Table 9. [44] The GDP grew at an average rate of 5.8% at constant prices for the first four years of implementation of the Ninth Development Plan (1997-2001). Among the gains made, is an improvement in the incomes and purchasing power of the population

related to an increase in per capita income at a sustained rate (3% at constant prices over the period 1997-1999) which reached 2644 Tunisian dinars in 1999. Moreover the poverty rate stood at less than 4.2% of the population in 2000 after being 6% in 1999.

Year	1997	1999	2000	2001
Population with employment in thousands	2503.6	2635.0	2704.9	2788.8
In the industrial sector in%	34.0	33.8	33.2	33.9
In the commerce and service sectors in%	44.0	43.5	44.7	44.1
Rate of unemployment in%	15.7	15.8	15.6	15.0
Rate of poverty in%	6	6	4.2	-

Table 9. Key Economic and Social Indicators. (From: Tunisian National Statistical Institute June 2002 and Tunisia –Key Economic and Social Indicators January 2000)

As an indicator of the benefits earned by the Tunisian economy through the use of e-commerce, the virtual Tunisian office (TradeNet) specialized in the electronic intermediary (services and liaison point) for the companies' imports and exports reported the following results in 2001. [45]

- 150,000 imports certificates (regularizing the situation of goods imported by entrepreneurs)
- 10,000 import authorizations (authorizing entrepreneurs to import goods)
- 1,000,000 customers' formalities (finalizing the goods import)
- 10,000 folders (for new entrepreneurs' registrations)

This increase in imports during 2001 was the result of a 25.1% rise in consumer goods [46]. Furthermore, the export promotion center website realized about 90,000 visits/month in 2001. [47] The previous result of imports and exports may be explained by the rise of exports from year 2000 to year 2001 valued at 9,503.7 Tunisian Million Dinars (TND) (roughly US$ 7.5 Billion). The e-commerce culture seems more embraced by the Tunisian population; as a matter of fact two Tunisian universities (ISET and SUPCom) posted eight hundred (800) scholar subscriptions online in one week in year

2001. This indicates the cultural change from face-to-face practice toward online practice in Tunisia.

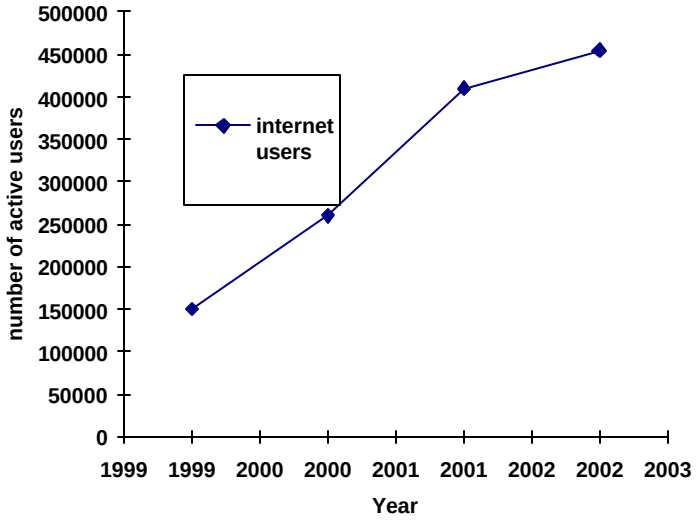

Fig 3. Tunsian Internet Usage's number through the years

Figure 3. Tunisian Exponential Growth of Internet Usage.

There is exponential growth of Internet usage in Tunisia as indicated in Figure 3 (Tunisian Internet Usage's number through the years). All these descriptive facts, combined with the lack of pure quantitative e-commerce data, generate the following possible reasonable tentative correlational and quantitative analysis about the nature of the relationship between Tunisian economic growth and the Tunisian e-commerce growth.

A. CORRELATIONAL ANALYSIS[§]

A correlation is a systematic and dependable association between two sets of data; it doesn't necessarily indicate causation (the relationship could be purely coincidental or

---

♣ All the data provided by the Tunisian agencies are computed relatively to year 1990. To be consistent in the computation, the year 1990 was chosen the base for the calculation.

** The overall approach to calculating the relationship between e-commerce growth and the country's GDPs as an economic indicator was discussed and approved by Senior Lecturer Raymond E. Franck. Jr. (Naval Postgraduate School-Monterey-CA) as an acceptable approach because of the lack of data. The conversation was held in Summer 2002.

determined by some factor not included in the analysis). However with the descriptive factors (such as regulatory strategy, awareness strategy, the firm orientation of government toward the digital economy and the Tunisian population readiness), the coming analysis tend to show more or less an existent relationship between the Tunisian e-commerce data and the Tunisian economical data. The correlation is shown through the computation of a single number that describes the degree of relationship between the two variables, and the graphical plot of these two variables.

To look at the relationship between the two variables, the inferred growth rate of the Tunisian e-commerce revenues from the year 1999 through the year 2002 and the Tunisian gross domestic Product (G.D.P) as an indicator of the country's economic growth, the following methods and assumptions were considered.

- Comparison of the values added of each year i and the year (i-1) preceding it, starting from year 1990 (? i =. (Value added year i) – (value added year i-1)). Computation of the rate in percent of the values added relatively to the year 1990 (% RI = ? i /value added for the year 1990).
- Calculation of the differences between each rate and the one preceding it ($Oi = \%Ri - \%Ri_{-1}$) for the period 1990 through 1998. These computed values represent the yearly improvement rate.
- Calculation of the average of improvements in the values added from year 1990 to the year 1998 (average = $\sum \Omega i$ /7)
- Assuming that the Tunisian e-commerce started giving results in 1999 (after being understood), after two years from its implementation, and using the average of the values Oi, the forecast of the percent rates of improvements in the values added for the years 1999 through June 2002 was calculated.
- Comparison between the real values added provided by the Tunisian Statistical National Institute and the forecasted values already calculated using the average improvements rate. This difference of rate was inferred to be the result of e-commerce. The chart below summarizes all the calculation process for the computation of the correlational coefficient r (Table 10 Computational Approach).

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	06/2002
Commercial Activities' value added	8175.8	8908.3	10079.5	10715.6	11555.7	12438	14024.4	15304.8	16471.6	18037	19506.4	21216.8	22998.2
G.D.P at the market price	10815.7	12028.8	13705.9	14662.9	15813.8	17051.8	19066.2	20898.2	22560.8	24671.6	26685.3	28878.9	31267.8
Variation = ?i = V.A.Year (i+1) – V.A.Yeari	0	732.5	1171.2	636.1	840.1	882.3	1586.4	1280.4	1166.3	1565.9	1469.4	1710.4	1781.4
Rate of increase relative to year 1990	0	8.96	14.32	7.78	10.27	10.79	19.40	15.66	14.26	19.15	17.97	20.92	21.78
Oi =%Ri - %Ri-1													
% Average rate of improvement = ? Oi/7			0. 76										
Forecasted values added (%Ri+1 = Ri + average rate of improvement)										15.02	15.78	16.53	17.29
Inferred rate from e-commerce =%RI – Forecasted values added rate										4.13	2.19	4.38	4.49

Table 10. Computational Approach.

Correlation between infered Tunisian e-commerce revenues improvements rate for the years 1999 through 2002 and the G.D.P as a Tunisian economic indicator for the same period of time

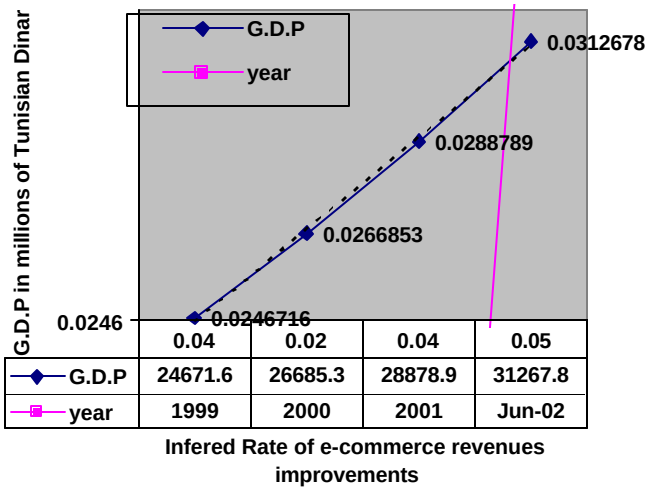

Figure 4. Inferred Rate of E-Commerce Revenues.

According to the bivariate plot (Figure 4), the relationship between the variables Tunisian gross domestic product (G.D.P) and the inferred growth rate of the Tunisian e-commerce is a positive one because the scattered graph moves up from left to right or has a positive slope. Since the correlation is nothing more than a quantitative estimate of the relationship, we would expect a positive correlation which means higher scores on one variable tend to be paired with higher scores on the other and that lower scores on one variable tend to be paired with lower scores on the other. To confirm the graphical result shown by the plot, here is the result of the computation of the correlation value r.

$$r = \frac{N\sum XiYi - (\sum Xi)(\sum Yi)}{\sqrt{[N\sum Xi^2 - (\sum Xi)^2][N\sum Yi^2 - (\sum Yi)^2]}}$$

N = Number of years whose data was recorded in the calculation of correlation

$\sum XiYi$ = Sum of the products of paired values

$\sum Xi^2$ = Sum of squared Xi (inferred values added rates due to e-commerce)

$\sum Yi^2$ = Sum of squared Yi (G.D.P values)

$\sum Xi$ = Sum of X values where i $\in$ {1, 2, 3, 4}

$\sum Yi$ = Sum of Y values where i $\in$ {1, 2, 3, 4}

r is always between -1.0 and +1.0. If the correlation is negative, we have a negative relationship; if it is positive, the relationship is positive.

N = 4

$\sum XiYi$ = 4273.18323

$\sum Xi^2$ = 0.00612225

$\sum Yi^2$ = 31322459265

$\sum Xi$ = O.1593445

$\sum Yi$ = 111503.6

$$(\sum Xi)^2 = 0.023084$$

$$(\sum Yi)^2 = 12433052813$$

$$r = \frac{4(4273.18323) - (0.1593445)(111503.6)}{\sqrt{[4(0.00612225) - (0.023084)][4(31322459262) - (12433052813)]}}$$

$$\Updownarrow$$

$$r = \frac{151.494254}{368.745276} = 0.410837$$

So, the correlation for our four cases is .41, which is a positive relationship. This result shows a relationship between the inferred growth rate of the Tunisian e-commerce revenues from the year 1999 through the year 2002 and the Tunisian gross domestic Product (G.D.P) as an indicator of the country's economic growth.

This correlation, according to the results inferred and computed, appears to be moderate yet. In the meantime, the positive aspect of these results is the indication (in some way) of an existent tangible affect of e-commerce adoption by the different Tunisian companies on the Tunisian economy. The positive side of e-commerce starts to be felt in Tunisia; however the country is still at the early stage of this phenomenon.

B. QUANTITATIVE ANALYSIS

As mentioned in Chapter III, the Internet economy method was used as a quantitative analysis in this case study. The four layers are listed below with descriptions of the types of companies and names of some of the actual companies in each category.

1. Layer One: The Internet Infrastructure Layer

This layer is the foundation for the implementation of the electronic commerce; it includes companies that help create an Internet Protocol (IP) based network infrastructure. This layer includes:

- Internet backbone providers (e.g., Tunisian Internet Agency (ATI), ISRIT)
- Internet service providers (e.g., IRSIT, PLANET, 3S GLOBAL NET)
- Networking hardware and software companies (e.g., ASTER Informatique, BITS, DataBOX)
- Hardware distributors (e.g., ORBIT (Computers and multimedia), S.A.M.I. (Apple computers distributor), Tunisie Micro-Informatique

(TMI) Computer sales, distribution and maintenance. Development of computer solutions).

- Security vendors (e.g., National Electronic Certification Agency (ANCE), Salama.tn (A Tunisian web site dedicated to computer security))
- Cable makers (e.g., Tunisie Cables (A Tunisian ISO 9002 company that manufactures power and telecommunication cables))

2. Layer Two: The Internet Application Layer

This layer uses the previous one as a repository and assures the feasibility to perform business activities online. This layer includes:

- Internet consultants (e.g., Mail.tn, MediaNova, OPEN.NET, Tuninet, HighTech SQL)
- Internet commerce applications (e.g., Tuninet Zeroflux Virtual Reality, Inc. Proweb Media Microworks Media).
- Multimedia applications (e.g., Microworks Media, MediaNova).
- Web development software (e.g., HighTech SQL, OPEN.NET)
- Search engine software (e.g., Nadhour Tunisia, Tunisia Online)
- Online training (Bits -Bureautique & Informatique Tunisian Society-)
- Web-enabled databases (e.g., ORADIST (Oracle, SGBDR, databases, Relational database management systems (RDBMS))

3. Layer Three: The Internet Intermediary layer

This layer increases the efficiency of electronic markets. This layer includes:

- Market makers in vertical industries (e.g., EasyCommerce, Shopping Gallery at CEPEX, STELFAIR (The virtual fair of Tunisian products and services) Aswek Tunis (On-line shopping mall))
- Online travel agents (e.g., North-South Services -Webmaster for hotels and business companies-).
- Online brokerages (e.g., TRAD@NET)
- Portals/Content providers (e.g., Nadhour Tunisia, Tunisia online)
- Internet ad brokers (e.g., Akhbar Tunis, Tunisia Online)
- Online advertising (e.g., Belmakett (Advertising, graphics creations, web design))

4. Layer Four: The Internet Commerce Layer

Internet commerce involves the sales of products and services to consumers or businesses over the Internet. The categories in this Internet commerce layer include:

- E-tailers (e.g., EL maktaba)
- Manufacturers selling online (e.g., SOCOPA Handcrafts (On-line store of Tunisian artifacts))
- Airlines selling online tickets (Tunis air)
- Online entertainment and professional services (Tunisia Online)

5. The Internet Economy Indicators

Gross assumed revenues and jobs were measured using the four Internet economy layers shown in Table 11 (the four Tunisian Internet Economy indicators). The component indicators in each level were added.

	Assumed Gross Internet Revenues	**Assumed Attributed Internet Jobs**
Internet Infrastructure Layer	TND 53,317.3 Billion	46,500
Application Infrastructure Layer	TND 0.052.Billion	24,000
Intermediary/Market Maker Layer	TND 9.0 Billion	1,000
Internet Commerce Layer	…….	…….
The Gross Assumed Internet Economy Indicators	**TND 62,369.3 Billion**	**71,500**

Table 11. The Four Tunisian Internet Economy Indicators.

The way in which Internet revenues and jobs are measured in this study is based on the lowest assumed values possible. The purpose of this method is not to show the exact revenues or the exact number of jobs generated by the use of the "phenomenon e-commerce", but just to illustrate the existence of a positive effect of the internet and its applications on the Tunisian economy.

6. Notices and Assumptions

This study clearly designates the roles and the relative magnitudes of four distinct but related layers of the Internet economy.

The first two layers (infrastructure and applications) provide the foundation for the conduct of Internet commerce, and account for a large portion of total gross revenues associated with the digital economy. The third intermediary layer also is a major contributor to the Internet economy.

The fourth Internet commerce layer is much larger than previously reported estimates. However because of lack of data this layer was not considered.

While any study of this complexity will rely on assumptions and responses from different stakeholders participating in the study, the above results are based on the analysis of existing data and the following methods and assumptions:

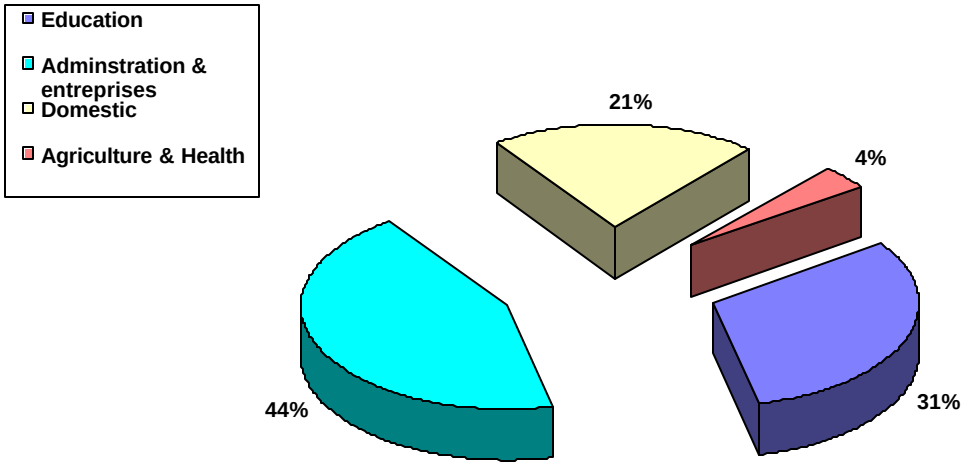

Fig 5. Rate of accounts by sector

Figure 5. Rate of Accounts by Sector.

The number of Internet accounts in Tunisia for the year 2001 is 29343 [66,000 (at the end of 2001) - 36657 (at the end of year 2000)] (44% administration and enterprises, 31% education, 21% domestic, and 4% agriculture and health) see Figure 5.

Number of administrations and enterprises' accounts is $\frac{29343*44}{100}=12910.92$

Number of educational accounts is $\frac{29343*31}{100}=9096.33$

Number of domestic accounts is $\frac{29343*21}{100}=6162.03$

Number of agriculture and health accounts is $\frac{29343*4}{100}=1173.72$.

	Installation tariffs in Tunisian dinar without tax	**Monthly subscription in Tunisian dinar without tax**	**e-mail accounts**
RTC monoposte	40/80	20	2
RTC multiposte	60/200	50 (2 to 5 posts)	3
X25 (28 Kbps)	100	100	6
X25 (64 Kbps)	100	150	20
SL (28 Kbps)	…	……	….
SL (64 Kbps)	500	400	50
SL (128 Kbps)	500	800	100
SL (256 Kbps)	500	1400	100
SL (512 Kbps)	500	2600	100
RNIS (64.4 Kbps)	100	100	10
RNIS (128.8 Kbps)	100	150	20

Table 12. Access Types and Tariffs. (From: Tunisian Internet Agency June 2002)

From the different Access types and tariffs shown in Table 12, the following assumptions were made:

- First Assumption: all subscribers of the enterprises, education and agriculture and health have only the basic RTC 5 network stations (the most convenient for enterprises).
- The unique price according to the tariffs published by the Tunisian Internet Service Provider (PlaNet Tunisie website June 2002) is:
  - Web server roaming in the ISP's infrastructure 1500 TND/year
  - Tax 1500*10/100= 150 TND
  - RTC subscription 500 TND/year

- Tax 500 * 10/100 = 50 TND
- Establishment accounts' expenses is 75 TND
- Tax 75*10/100 = 7.5 TND

Total cost by account is 1500+150+500+50+75 +7.5 = 2282.5 TND

- The total price for the enterprises, education, agriculture, and health will be 23180.97 * 2282.5 = 52,910564.03 TND
- The price of a personal e-mail account (5 + 0.5) * 12 = 66 TND/year
- The total costs of the 6162.03 personal accounts is 6162.03* 66 = 406693.98 TND

The total price for this first layer is 52910564.03 + 406693.98 = 53317257.98 TND

- Second Assumption: the total number of web sites is only 616 in 2001 and 300 in year 2000. In year 2001 316 web sites were registered under a Tunisian domain at the price of 42 TND/web +42*10/100 taxes
- Third Assumption: the average price of building a web site is 120 TND, which means the **gross revenues is 166.2* 316 = 52519.2 TND (include taxes)**

According to the references, as mentioned before, there were 90.000 visits to the CEPEX web site per month in 2001. Assume only 10% of the visitors made a transaction at an average of 1000 TND per transaction. **The gross revenues will be 9000 * 1000 = 9,000 000 TND**

The Internet commerce layer was not taken in account just to avoid an overlap of assumptions.

To compute the estimated number of employments generated by the first layer, 100 jobs created by the publinet in 2001 added to an assumed 46361.94 jobs (each of the 23180.97 enterprises have only two people in charge of the network, the internet applications and the maintenance), **the total is 46461.94 jobs**

The second layer the number of jobs for the people working at web design, advertising, online courses and web enabled database is assumed to be 24000.

The third layer only the CEPEX was considered with only 100 jobs.

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V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Tunisia is incorporating information technology as an important ingredient of its economy. Its exponential adoption of the Internet and its applications, principally e-commerce, seemingly contributed to the Tunisian economic growth. The results illustrated markets' expenditures, efficiency increase and wealth maximization (consumers with sufficiently strong purchasing power that want greater access to consumer goods and equipment. In less than a decade the per capita revenue has doubled. This proves the exemplary development of the Tunisian market). Global consumption increased by 5.1% at constant prices during the 1997-2001 periods. Tunisian enterprises have modern Telecommunications, a regulatory e-commerce framework, the support of the government, political stability, as well as the reputation of being a historical trading nation from which they should take advantage and play more active role in the development of global e-marketplaces.

The results of Tunisian e-commerce are only starting to be felt; Tunisia is still at the early stage of this phenomenon. Indeed, the fact that Tunisia is in the early stage of e-commerce means that there is considerable opportunity to design and implement a winning strategy. In particular, while there has been a huge government focus on e-commerce, there is currently neither high response from the private sector to fully seek e-commerce opportunities nor trust from the customer. It is clear however that more success will result from working steadily without giving up in bringing together all Tunisian e-commerce's stakeholders and ensuring customer confidence.

It is important to note that all of the parties who participate at developing a successful e-commerce strategy will be significant beneficiaries. The essential task is to establish a vision for Tunisian industries, associations and government which they can pursue for common purpose.

B. RECOMMENDATIONS

The following recommendations are targeting particularly the Tunisian e-commerce stakeholders, and generally all the e-commerce partakers around the world since the e-commerce practice is quasi-standard.

The government has taken an active approach in developing the Tunisian telecommunication infrastructure and the establishment of the legal and regulatory e-commerce framework; however, it is very important to continue steadily building awareness among all the Tunisian economy's stakeholders (consumers and companies' decision makers) by organizing more awareness campaigns such as the campaign "Internet Caravans", about the benefits of Internet services and electronic commerce carried out on September 1999, the conference on Internet applications and e-commerce held on November 9, 1999 which targeted chief executive officers, chief information officers, and others important personalities from the public and private sectors, "open Internet days" when all the Tunisian Internet public centers (PubliNets) were open for free during the second week of November 1999, and lastly the Tunisian national television's broadcast of awards given to the best local web sites.

While there is a huge opportunity, time is short. The private sector in Tunisia must play a leading role, setting the example for all the parties involved in business to join in the exciting Tunisian government vision for economic development. Serving as an example is required to encourage the growth of e-commerce. The private sector should lead in the development of E-Commerce while relying on Government which already laid the framework assuring consumer protection. As planned, the specialized governmental services should continue their action plan of electronic infrastructure's development in order to keep the Internet and e-commerce adoption rate growing exponentially throughout the country. In this regard, it will be vital for public and private sectors to put their hands together in only one objective – taking full advantage of the Internet and mainly e-commerce. In this context the Tunisian president said:

> the interest taken by the private sector in acceding to the electronic commerce has not lived up to our expectations in spite of the procedures and encouragements provided by the government in this field, the development of communication networks, the spread of digital culture and the need for integration into the new economy. [51]

This is a perfect time for the Tunisian companies and entrepreneurs especially in the private sector to cope with the major changes in the marketing style, and make e-commerce an opportunity to enhance their productivity and improve their return on investment (ROI).

Once again, Tunisia has a culture of adaptability earned from its strategic position (as being the point tying Africa to Europe) and economic openness (from being the melting pot of different civilizations) allowing its enterprises to move quickly in establishing the appropriate strategies to enforce the emergence of the county's e-commerce. Our key recommendations are targeted at reminding foreign investors to take advantage of investing in Tunisia and benefit from the country's proximity and preferential trading relations with the European Union and the Maghreb Arab Union, as well as from the encouraging Investment's Code (confirms the freedom to invest in most fields and reinforces the Tunisian economy openness to the global world). In this context, it is worth mentioning the Tunisian-U.S. Bilateral Investment Treaty (BIT), signed in January 1993, that guarantees the safety of investments and profit repatriation [48]. The following are some benefits when investing in Tunisia

- A skilled up-to-date labor force
- An investors' protection
- High opportunity to increase your exports
- Freedom to invest in numerous sectors
- A functional infrastructure continuously improving
- A foreign exchange market with freedom of transfer

The director general of the United Nations Industrial Development Organization (UNIDO) said at the start of Carthage Investment Forum [49]. "From the "*local attraction"* perspective, let me say at the outset that you would have to go a long way in Africa and the Middle East to find a much better combination of prospects than those in Tunisia. The surrounding conditions for industrial investment are truly impressive - from the overall growth prospects to the measures for maintaining the balance of national accounts, from the investment in physical infrastructure to the prevailing legal conditions and investment incentives, from the rising quality of the workforce to the public investment in technological infrastructure, and from the proximity of other markets (the

EU to the north, the Maghreb region all around and the African Economic Community to the South), to the improving institutional arrangements for accessing those markets". He added "An investment in Tunisia is an invest in a region that consistently yields the highest return on investment compared to all other regions of the world — giving four times the return compared to developed countries, double the return on your investments in Asia, two thirds more than in Latin America".

Furthermore, according to The American Heritage Foundation, Tunisia is among the world's stable economies as shown in Figure 6**.** [50]

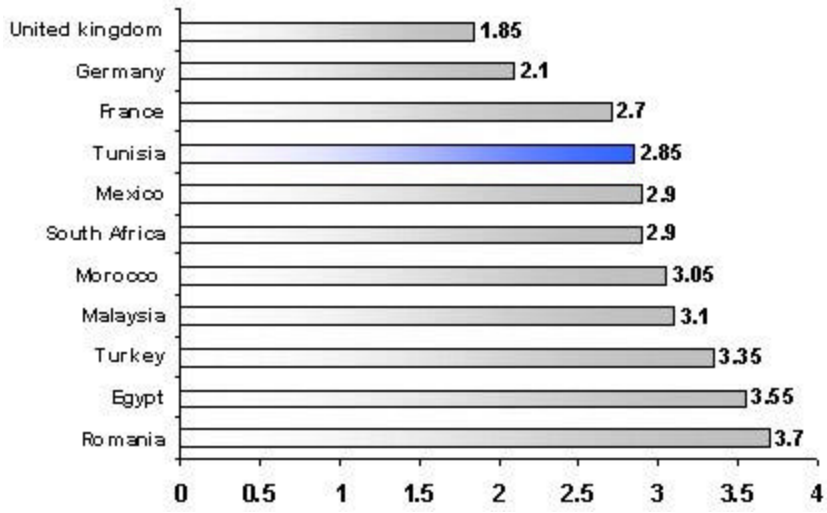

Figure 6. Index of Economic Freedom Scale from 0-5 (0 = Liberal Economy, 5 = Protected Economy) 2002- Index of Economic Freedom, the Heritage Foundation in Washington. Graph Representing Some Selected Countries Published at www.investintunisia.com. (From: http://www.heritage.org/research/features/index/2002/world.html)

This economic freedom is generated by the following factors:

- Unrestricted investment for Tunisians and foreigners in many business fields
- The degree to which the production is subject to international competition.
- The degree to which the production's prices are governed by market systems
- The degree of privatization reached.

The first scores were allocated to Hong Kong (1.35), and Singapore (1.55). The scale is defined as follows

- Free Economy from 1.00 to 1.95
- Mostly free from 2.00 to 2.95
- Mostly unfree from 3.00 to 3.95
- Repressed from 4.00 to 5.00
- Not Ranked

According to "The French Export Credit Insurance Company, COFACE" attributes to Tunisia a quiet good country-risk factors because its economy has not suffered much from international economic problems.

Jack Paton, Manager of the Standard & Poor's (http://www.standardandpoors.com/AboutUs/index.html), a division of the McGraw-Hill Companies, known by providing objective information and analytical services to the financial markets, said:

> Tunisia is well graded by our agency. As for the local currency, Tunisia's ranking is A. The rating system is very useful as a country like Tunisia precedes several other countries in this area.

Transparency International (TI), the world's leading non-governmental organization fighting corruption ranked Tunisia 31st among 91 countries in the way of how their people live and do business and assess corruption in the countries' public sector.

The previous indicators serve as arguments to show the degree to which the country works to establish a clean work environment. This fact may encourage direct foreign investment when investing in Tunisia. At the same time the Tunisian economy will also benefit from these investments. The foreign investments will increase and stimulate the use of the Internet and its application, mainly e-commerce, in Tunisia and enhance the competition toward innovation. As a result Tunisia will witness a blooming in e-commerce practice and more emergences in the economy.

Another valuable recommendation tends to assure investors and customers to be confident and use e-commerce for their transactions.

Rank	Country	Score CPI 2001
23	France	6.7
24	Belgium	6.6
31	**Tunisia**	**5.3**
31	Hungary	5.3
38	South Africa	4.8
42	Greece	4.2
44	Poland	4.1
47	Czech Republic	3.9
54	Turkey	3.6

Table 13. Transparency International. (From: Transparency international, June 2001)
Scale from 0-10 (10 high degree of transparency, 0 high level of corruption)

The government made efforts to establish confidence, security and privacy. Those factors continue to be primary inhibitors to the growth of the Tunisian e-commerce and the global digital economy in general. Consumers and businesses need to trust that their individual transactions are secure and private, and vendors must be assured that their content and services are protected and available only if paid for by authorized transactions.

The last recommendation is targeting online retailers that want to invade more markets and spread their goods. They must work on catching customers' eye balls by focusing on innovation and following these recommendations in designing their web sites.

- Offer promotional calculated transactions without abuse (example free delivery for certain amount of purchase)

- Try to make the access to the goods and prices as brief as possible (reduce the number of clicks). If the customer spends a lot of time looking for specific thing that means that the site is confusing.
- Be informal and pay more attention to the customer. Answer all his/her queries sincerely at once without any kind of intimidation or ignorance. Try to implement a successful CRM (Customer Relationship Management). Make the customer feel that you are on his side. Work for keeping your customers. Ask them their opinions, their preferences and their discomfort.
- Develop websites based on transparency
- Organize virtual shopping by links allowing the customer to search only what he/she needs without being bored
- Update online information about products' availability
- Be aware that not everything can be sold over the Internet. Focus on goods that make economic sense.
- Even with low costs, never forget to provide detailed information about any transaction
- Be aware that business is the whole body and online is just a part of the body. They have to be well integrated. In other words do not ignore the other selling channels.

C. FUTURE RESEARCH

Regardless of the security, confidence and non trust issues, further research should be conducted to discover and highlight the major obstacles slowing down the growth of e-commerce in the world as global and in the Tunisian country as a part. Once identified, remedies to these challenges facing e-entrepreneurs, firms and the national financial system on one hand and the barriers to entries for SME (Small and Medium-sized-business Enterprises) are required to be set up.

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